

CLAIMS:

1. Apparatus for separating CO₂ from a gas stream containing CO₂ and an anaesthetic gas, the apparatus comprising a gas separation device and means for transporting the gas stream at a periodically varying flow rate through the gas separation device, the device comprising a supported carrier liquid membrane in which the carrier species is an organic base present at a concentration sufficient to provide a separation factor α (CO₂, a),

$$\text{where } \alpha (\text{CO}_2, a) = \frac{R_{\text{CO}_2}}{p_{\text{CO}_2}} \cdot \frac{p_a}{R_a}$$

wherein R represents permeation rate, p partial pressure of a gas in the feed gas stream and a an anaesthetic gas, greater than unity.

2. Apparatus as claimed in claim 1, wherein the carrier species concentration is such as to provide an α value of at least 15.

3. Apparatus as claimed in claim 2, wherein the α value is at least 60.

4. Apparatus as claimed in any preceding claim, wherein the device comprises a supported carrier liquid membrane in which the carrier is present in a concentration of at least 4.5 mol.dm⁻³.

5. Apparatus as claimed in claim 4, wherein the carrier is present in a concentration within the range of from 4.5 to 6 mol.dm⁻³.

6. Apparatus as claimed in any preceding claim, wherein the base is diethanolamine.

7. Apparatus as claimed in any one of claims 1 to 5,
wherein the base is ethanolamine or ethylenediamine.
- 5 8. Apparatus as claimed in any preceding claim, wherein the
carrier liquid is an aqueous solution.
9. Apparatus as claimed in any one of claims 1 to 7,
wherein the carrier liquid is a solution of the carrier in an
10 organic solvent.
10. Apparatus as claimed in any preceding claim, wherein the
membrane support is a porous polymer.
- 15 11. Apparatus as claimed in claim 10, wherein the polymer is
a polysulphone or polyacrylonitrile.
12. Apparatus as claimed in any preceding claim, wherein the
membrane is a hollow fibre membrane.
- 20 13. Apparatus as claimed in claim 12, wherein the membrane
is in the form of a fibre bundle.
14. Apparatus as claimed in any preceding claim, which also
25 comprises means for generating a sweep gas stream.
15. Apparatus as claimed in claim 14, which comprises means
for humidifying the sweep gas stream.
- 30 16. A device for separating gases which comprises a
supported carrier liquid membrane in which the carrier is an
organic base present in a concentration of at least 4.5
mol.dm⁻³.

17. A device as claimed in claim 16, wherein the carrier is present in a concentration within the range of from 4.5 to 6 mol.dm⁻³.

5 18. A device as claimed in claim 16 or claim 17, wherein the base is diethanolamine.

19. A device as claimed in claim 16 or claim 17, wherein the base is ethanolamine or ethylenediamine.

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20. A device as claimed in any one of claims 16 to 19, wherein the carrier liquid is an aqueous solution.

21. A device as claimed in any one of claims 16 to 20,
15 wherein the membrane support is a porous polymer.

22. A device as claimed in claim 21, wherein the polymer is a polysulphone or polyacrylonitrile.

20 23. A device as claimed in any one of claims 16 to 22, wherein the membrane support is in the form of a hollow fibre.

24. A device as claimed in claim 23, wherein the membrane
25 support is in the form of a fibre bundle.

25. A device as claimed in any one of claims 16 to 22, wherein the membrane support is in sheet form.

30 26. A device for separating carbon dioxide from a gas stream containing carbon dioxide and an anaesthetic gas, which device comprises a supported carrier liquid membrane assembly in which the carrier is an organic base present in a concentration of at least 4.5 mol.dm⁻³.

27. A device as claimed in claim 26 having one or more of the features defined in any of claims 17 to 25.

28. A method of separating carbon dioxide from a gas stream
5 in anaesthesia, which comprises contacting the gas stream with a supported carrier liquid membrane in which the carrier is an organic base present in a concentration of at least 4.5 mol.dm⁻³.

10 29. A method of separating carbon dioxide from a gas stream in anaesthesia, which comprises contacting the gas stream with a supported carrier liquid membrane in which the carrier is an organic base present at a concentration sufficient to provide a separation factor α (CO₂, a) of at least unity.

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30. A method as claimed in claim 29, wherein the carrier is present at a concentration sufficient to provide a separation factor of at least 15.

20 31. A method as claimed in claim 29, wherein the carrier is present at a concentration sufficient to provide a separation factor of at least 60.

32. A method as claimed in claim 29, wherein the carrier is
25 present in a concentration of at least 4.5 mol.dm⁻³.

33. A method as claimed in any one of claims 28 to 32, wherein the carrier is as defined in any one of claims 5 to 9.

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34. A method for the separation of carbon dioxide from a gas stream containing it, which comprises contacting the gas stream with a supported carrier liquid membrane in which the carrier is an organic base present in a concentration of at
35 least 4.5 mol.dm⁻³.

35. Apparatus as claimed in any one of claims 1 to 13, which also comprises a second supported carrier liquid membrane comprising the carrier species, means for transporting a
5 sweep gas past the second membrane, a mass of carrier liquid contacting both membranes, and means for circulating carrier liquid past the membranes.